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Comment on bg-2022-15

Arnaud P. Praplan (Referee)

Referee comment on "Reviews and syntheses: VOC emissions from soil cover in boreal and temperate natural ecosystems of the Northern Hemisphere " by Valery A. Isidorov and Andrej A. Zaitsev, Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-15-RC1>, 2022

The review and syntheses article titled "VOC emissions from soil cover in boreal and temperate natural ecosystems of the Northern Hemisphere" by Isidorov and Zaitsev is a comprehensive review covering several decades of research on this topic. It is extremely important work, which highlights the knowledge gaps on which research should focus and also will encourage model developers to consider processes that have been overlooked for too long in their calculations.

While the review is well written and very interesting to read, I have been wondering about its structure and the flow of information. I understand that it is no small task to organise the very large amount of information included in this review that is often all interconnected. Nevertheless, in its current form, it seems that readers will have to go back and forth unnecessarily between chapters. For this reason, even though I absolutely do recommend Biogeosciences to publish the review, I would like to see a minor revision of its structure.

In my view, the chapters presented are not sufficiently clearly defined and overlap heavily. While it is a very interesting and comprehensive review to read, it was not clear to me what was the logic in the way the information is presented. More specifically, this is what I have been thinking:

- Do litter-decomposing microbes (chapter IV) constitute a biotic control of leaf litter decomposition? If so, why is it discussed separately from chapter II?

- Every chapter seems to provide information about the qualitative composition of

emissions, not only chapter III.

- Laboratory and field measurements (chapter V) seem to inform conclusions on the other topics as well.

Here are some suggestions on how the review could be presented with slightly different (sub)sections:

1) Introduction: It currently makes an excellent job to present the topic and its relevance. It also establish important definitions for the comprehension of the literature presented. Not much need for changes here.

2) Start the review with living soil cover (LSC), lines 370-398, which is similar to the very common emission studies from trees. Include here a comparison of the LSC's and trees' biomasses and their respective potential contributions to VOC emissions (both qualitative and quantitative information). Field and laboratory measurements on LSC should be mentioned here.

3) From there, move on to leaf litter decomposition, first describing abiotic processing, such as the very important work about the influence of UV radiation on the emissions and other environmental factors (e.g. temperature, soil humidity). Once more, qualitative and quantitative information from both field work and laboratory experiments supporting it can be included here.

4) Continue with the even more complex biotic processes from larger ones (e.g. herbivory) to smaller ones (e.g. fungi, microbes) with the same ideas as for the previous chapter: include qualitative and quantitative results from relevant field work and laboratory experiments.

5) Conclusions: Just like the introduction, the conclusions are in their current form well written and highlight the knowledge gaps that should be focused on (e.g. processes, ecosystems) and the fact that VOC consumption by the same LSC and litter has not been investigated sufficiently.

In a similar fashion, the current supplementary is simply one section covering "Litter and LSC biomass distribution". Why not make two distinct sections (for instance LSC first, then litter production) and link them to the suggested new (sub)sections, highlighting that, in combination with information from the main text, this is a good starting point for the geophysical modelling community.

Minor technical comment:

- While the Introduction chapter is numbered with the arabic number 1, other chapters use roman numbers. This should be fixed for consistency.